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# COMPARISON

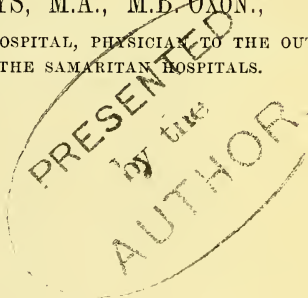
BETWEEN THE

## SCOLIOTIC AND OBLIQUELY CONTRACTED (NÆGELE) PELVES.

BY

FRANCIS HENRY CHAMPNEYS, M.A., M.B. OXON.,

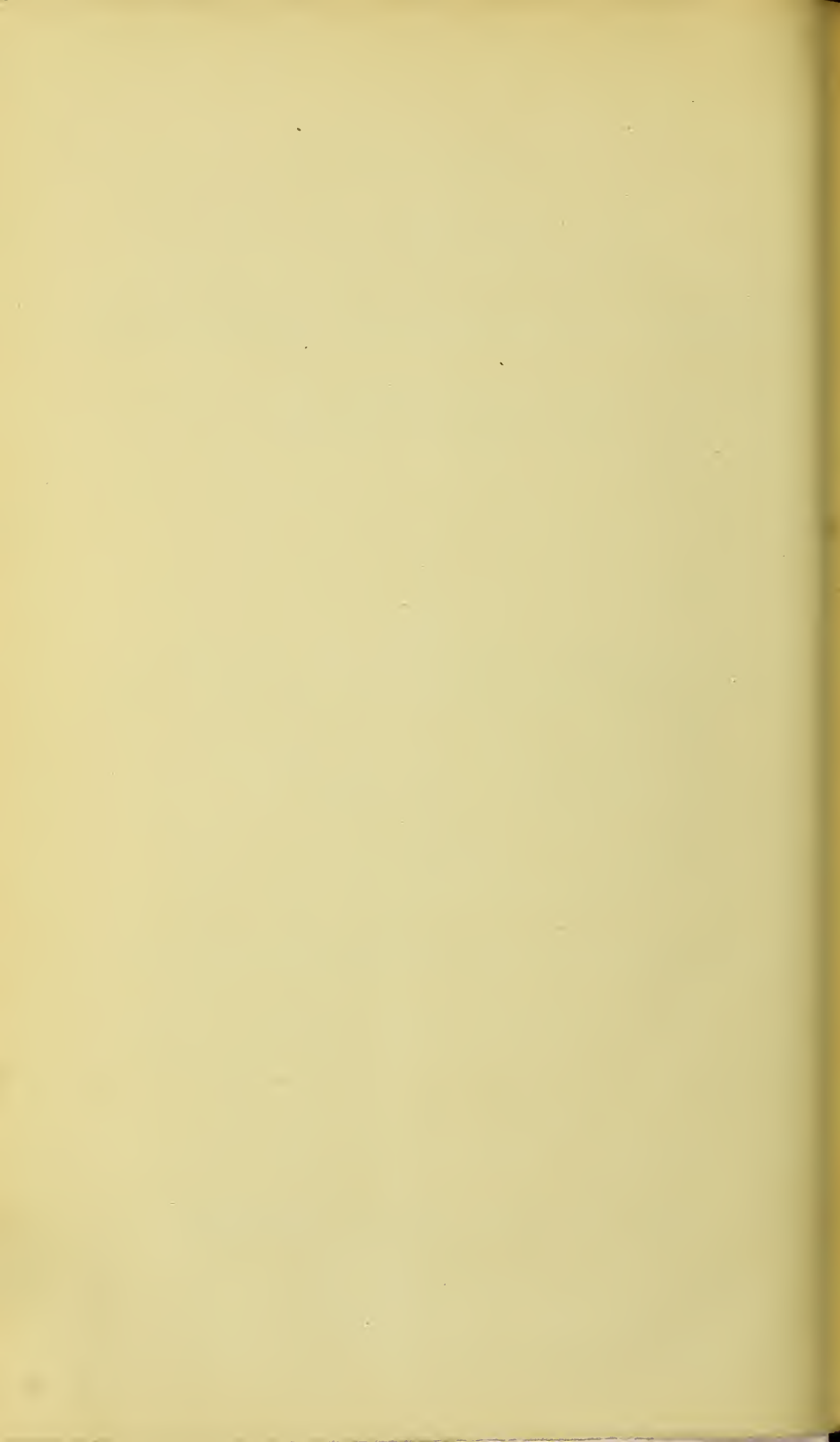
MEDICAL REGISTRAR TO ST BARTHOLOMEW'S HOSPITAL, PHYSICIAN TO THE OUT-  
PATIENTS AT QUEEN CHARLOTTE'S AND THE SAMARITAN HOSPITALS.



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## COMPARISON BETWEEN THE SCOLIOTIC AND OBLIQUELY CONTRACTED (NÆGELE) PELTS.

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It is impossible to compare a scoliotic pelvis with a pelvis of Nægele without seeing many points of resemblance which are the more instructive from the difference of the original conditions of distortion. This will be seen most easily from the following table:—

SCOLIOTIC.	NÆGELE.
<i>Cause.</i> —Scoliosis of lumbar vertebræ.	<i>Cause.</i> — Ankylosis of sacro-iliac joint.
<i>Effects.</i> —(1) Increase of pressure on the sacro-iliac joint of the overweighted (same) side.	<i>Effects.</i> —(1) Do.
(2) Dwarfing of os innominatum of same side.	(2) Do.
(3) Dwarfing of sacral ala of same side.	(3) Do.
(4) Traction at post. sup. spine of opposite side.	(4) Do.
(5) Expansion of opposite side.	(5) Do.
(6) Horizontal rotation of sacrum at sacro-iliac joint towards affected side.	(6) Do.
(7) Approximation of sacrum of same side to acetabulum (narrowing of sacro-cotyloid diameter).	(7) Do.
(8) Increasing weight thrown on affected side of pelvis.	(8) Do.
(9) Rotation of ilium of affected side round acetabular axis.	(9) Do.
(10) Rotation round antero-posterior axis; eversion of tuber ischii; enlargement of transverse diameter of outlet.	(10) Inversion of tuber ischii, contraction of trans. diameter of outlet.
(11) Increase of curve of posterior part of linea innominata, diminution of curve in anterior part on affected side.	(11) Linea innominata almost straight.
(12) Symphysis driven to opposite side.	(12) Do.
(13) Narrowing of conjugate (sometimes).	(13) No contraction of conjugate, sometimes enlargement.

## SCOLIOTIC.

## NÆGELE.

(14) Expansion of antero - posterior diameter of outlet.

(14) None.

(x) Lumbar scoliosis.

(z) Ankylosis of sacro-iliac joint from pressure (Leopold.)

No better instance of the method of agreement and the method of difference could be found. The agreements need not be further insisted on. The difference No. 11 is easily traceable to the presence or absence of ankylosis; No. 13 to the presence or absence of lordosis.

It is easy to see that where the fulcrum of a lever is not a hinge, the conditions are at once changed (Matthews Duncan's *Researches in Obstetrics*, p. 81). It is also easy to see that such ankylosis abolishes rotation round the fulcrum.

The difference No. 13 is not due to the presence or absence of scoliosis (as may be seen from purely scoliotic, not ricketty pelvises), but to the degree of forward inclination of the body weight, of which lumbar lordosis is usually a sign. The consequent lumbar scoliosis in Nægele's pelvis, and the consequent ankylosis from pressure in the scoliotic pelvis, are extremely interesting, cause and effect changing places in these two pelvises.

The whole study adds confirmation, if that is needed, to the "beam" and lever, as opposed to the "wedge" theory of the sacrum.

A few words are required to explain the inversion of the tuber ischii of the affected (same) side in the pelvis of Nægele, and its eversion in the scoliotic pelvis (No. 10). This eversion in the scoliotic pelvis is referred by Leopold to the action of the rotator muscles of the thigh, which pass from the tuber ischii to the great trochanter, and which act with greater force on the affected side from the fact of the weight falling on that leg, and the consequent higher position of the acetabulum. This explanation is ingenious, but has always seemed to me inadequate; and the comparison of these two pelvises throws considerable doubt on it. Moreover, it could at most produce eversion of the tuber ischii, but could never produce rotation of the whole innominate bone. Again, if the weight falls on the affected side in one pelvis, so

does it in the other, and the result should be the same. It is, however, precisely the reverse. We must seek, then, for another explanation. It seems to me that the explanation is to be found by contemplating the pelvis not only during walking, but also during sitting.

In the scoliotic pelvis, which is usually (it must be remembered) also a flat pelvis, the action of the posterior ilio-lumbar and ilio-sacral ligaments has been in marked operation on the iliac beam, which has acquired unusual flexion at the point of least resistance, and the pelvis has become laterally expanded. This flexion can be well perceived by marking the angle (seen from below) formed by the iliac and ischio-pubic portions of the os innominatum. The tuber ischii is thus carried somewhat outward, and the acetabulum and tuber ischii, instead of being practically in a straight line with the sacro-iliac joint (from which the weight is transmitted), lie outside. The portion of bone intervening between the resistance below (tuber ischii or acetabulum) and the weight above (extremity of sacral ala and posterior superior spine) may be regarded as a rod of a length determined by the distance between two lines (one drawn in the direction of the action of the weight, and the other in that of the resistance), opposite the sacro-iliac joint. The result will be the production of that which is technically known as "a couple of forces," the action of which is to produce rotation. The os innominatum is thus rotated round an antero-posterior axis through the sacro-iliac joint; the tuber ischii is everted.

It is evident that the more nearly the lines of pressure and weight coincide, the shorter is the rod, the less the rotation. In other words, the less the transverse pelvic diameter at the tubera ischii and acetabula, the less the subsequent rotation of the os innominatum. The eversion is produced on one side only, because the weight falls on that side; the other tuber ischii, on the contrary, is inverted from the traction of the great sacro-sciatic ligament, the tension of which is increased by the deviation of the sacrum to the opposite side, while the same ligament on the affected side is relaxed. The eversion of the tubera ischii, whether on one side or both, depends not on scoliosis primarily,



but on flattening of the pelvis, and this on forward inclination of the body weight, usually marked by lumbar lordosis.

In the pelvis of Naegele, ankylosis has prevented the operation of the iliac beam; the lateral expansion of the pelvis does not take place; the tuber ischii falls *within* the perpendicular of the weight of the body; the arm of the lever points *inwards*; rotation of the os innominatum and tuber ischii occurs *inwards*; the pelvic outlet of the same side is narrowed; but the sacro-iliac joint being destroyed, the inversion affects the tuber ischii only, rotation being impossible. In the ordinary rickety flat "Sitz-becken" both tubera ischii are everted. This view gains support by the contemplation of a child's pelvis, in which lateral expansion of the pelvis as a whole, and of the tubera ischii in particular, has not yet taken place. The usual dwarfing of the os innominatum of the affected side in the scoliotic pelvis would seem to show that the same dwarfing in the pelvis of Naegele is largely due to growth under abnormal pressure rather than to arrest of development as ordinarily understood.

Scoliotic pelvises occur in which the weight seems to have fallen first on one side and then on the other, the tuber ischii of the eventually overweighted side being inverted instead of everted. With regard to these it need only now be remarked that inversion of a certain degree will prevent the possibility of subsequent eversion even under reversed conditions, the lever having once pointed inwards. To procure eversion, the lever must first be made to point outwards; the weight of the body will subsequently increase its length. That sitting has a considerable effect appears from the frequent dwarfing of the whole affected os innominatum, even below the acetabulum. This it would seem must be produced by pressure at the tuber ischii.



